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An ANATOMICAL

# TREATISE R.

OF THE a. 5299.

# LIVER,

WITH

The DISEASES incident to it.

By a MEMBER of the *College of Physicians.*



L O N D O N :

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THE DICTIONARY

BY A MEMBER OF THE COLLEGE OF

PHYSICIANS

LONDON:  
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# TREATISE

OF THE

## LIVER, &c.



THE Liver may well be called a conglomerate Gland, as it is made up of several lesser Glands commodiously tied together, who empty themselves all into one common excretory Duct: It is seated

ed in the uppermost part of the lower Belly, immediately under the Diaphragm in the right Hypochondrium, which it almost wholly fills, and from whence it is extended beyond the Cartilago Ensiformis over the right Side of the Stomach, towards the left Hypochondrium; and where, towards its Extremities, it becomes sensibly narrower, and thinner; thereby, upon Occasion, to give the more room to the Stomach in its Distensions.

Its gibbous or convex Side is contiguous to the Bustard, or short Ribs on the right Side; as also to a great part of the Diaphragm.

Its hollow or concave Superficies towards the left Side, covers the Pylorus and the upper part of the Stomach, and also a part of the Omentum; but by the Interposition

position of the Gall-bladder, which for the most part lies between the Liver and the Stomach, near the Pylorus, as shall afterwards be describ'd. On the right Side it is extended to the right Kidneys, and covers a part of the Colon, and also the whole Duodenum, and some parts of the Jejunum and Omentum.

The Liver in a sound Man standing upright, hangs down below the short Ribs, almost as far as the Navel. In morbid Livers, its Bounds are oftentimes much farther extended, both beneath the Navel, and towards the left Side, to the short Ribs.

When these Tumors proceed from Causes that equally diffuse themselves thro' the whole Substance of the Liver, and encrease this Bowel according to all its Dimensions, they may be easily



distinguish'd from those of the neighbouring Parts, upon Examination ; because they always carry along with them the Figure of the Liver.

The Liver is likewise incident to particular Tumors both in its concave and convex Side, where the Cause is not so universal, as to extend it self over the whole Liver.

Those in the concave Superficies, are not so plainly to be known, as when they happen in the convex Side ; but may be concluded from the unusual fullness and hardness in the right Hypochondrium (the Seat of the Liver) together with the outward Colour of the Skin, which is usual for those to have, that labour under a diseas'd Liver.

Those in the convex Side, are nearer and more superficial, and  
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are easily to be come at ; which you may feel by your Hand, if you gently direct it along between the short Ribs, the Cartilago Ensiformis, and the Tumor.

These Tumors, as we have observ'd before, will be sometimes extended to the short Ribs of the left Side, which may impose upon the Incautious, who may take them for Tumours of the Spleen, but are distinguishable enough ; for they lie more superficially, and upon the Stomach, than those of the Spleen can ; unless in very extraordinary ones, which will plainly discover their Seat themselves by their unusual Bulk, by the extraordinary Distension and Weight in the left Side ; and lastly because those of the Spleen will appear much deeper than they can be.

The Ligaments which keep the Liver in its due Place and Situation, are chiefly three.

The first ties it to the Diaphragm, and is called *Ligamentum Suspensorium* ; because by the Assistance of this the Liver is principally supported, which otherwise, by reason of its great Bulk and Weight, would in an upright Posture fall down lower than it should do.

This Ligament is not only barely fixt to the outward Membrane of the Liver, but enters its very Substance ; and is likewise strongly tied to the *Capsula Communis* there, where the *Vena Umbilicalis* is contiguous to it, and which makes the second Ligament ; which tho' it be not always clos'd, yet after the Birth, has the use only of a Ligament, as before it had that of a Vein.

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It has its Terminations, one at the Fissure of the Liver, as was before observ'd, and the other at the Navel : This keeps the Liver from pressing too much upon the Diaphragm.

The third Ligament ; which is describ'd by Authors to tie the Liver to the *Cartilago Ensiformis* ; and to be a strong, broad, thin Membrane hanging loose, and arising (according to *Spigelius*) from the Membrane that cloaths the Liver ; and according to *Glisson*, is a Duplication of it only, appears in truth to be nothing else but a Continuation of the *Peritonæum*, or at least to arise from the *Peritonæum*, as the *Mediastinum* does from the *Pleura* in the middle Cavity ; where from the *Cartilago Ensiformis* taking its Course to the Liver, it connects one to the other ; running far-

ther along to the Diaphragm, it joins likewise to the Liver, in its gibbous and upper part all along from the left Side to the right. This Connection that it has with these Parts by the Continuation of the *Peritoneum*, must needs keep the Liver from fluctuating towards the right or left Side, or backwards.

Besides these aforementioned Ligaments, the Situation of the Liver is preserv'd by several other Connections; which cannot properly have the Name of Ligaments; and under this Consideration comes the *Vena Cava*, as also the *Vena Porta*, by Means of which it may be said to be tied to the Mesentery, Intestines, Stomach, Omentum, Spleen, and Pancreas: The *Porus biliaris* likewise ties it to the *Duodenum*, and sometimes the *Jejunum*; the hepatic

patick Artery to the cœliack, and the Nerves belonging to it to the Intercoftals.

These feveral Connections, as they moft of them contribute to preserve the Liver in its proper Place ; fo many of them fhew the neceffity there is that it fhould be fo secur'd from the Danger which muft enfue from its being displac'd.

But it is not fo entirely fixt as always to keep in the fame Pofture ; for it is manifelt it alters that oftentimes, as we do that of our Bodies ; which may be demonstrated by marking its Tumors with Ink ; for then, upon changing the Pofture of the Body, the Tumor will leave the place fo mark'd.

That this close Connection of the Liver with the Diaphragm, muft oblige it to follow its Motion,



tion, is likewise a necessary Consequence. Thus in Inspiration, when the Diaphragm contracts it self in order to elevate the Thorax, it is with the Liver carry'd down farther into the Abdomen; as in Expiration, when the Diaphragm is relaxed in its turn, and is driven higher into the middle Cavity, the Liver goes along with it in the same Action.

This will be an Instruction to Physicians, who are to examine the State of the Liver, to let it be in the Act of Inspiration; for then the Liver being thrust down farther into the Abdomen, it is much easier to be come at, and more distinctly to be felt.

As in the natural State the Liver should always be subservient to the Motion of the Diaphragm; so in a preternatural one, it oftentimes mightily incommodes it,  
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both by disorders of its own, and also by ill Offices done to it by the neighbouring Parts.

Thus the Liver being upon any Accident grown bigger, it induces a Difficulty of Breathing; a Symptom frequently observed in rickety Children, whose Livers are oftentimes larger than ordinary.

The Liver sometimes will grow to the short Ribs, which is the Distemper with us, I presume, call'd Liver-grown, and which of Necessity must be a very great hindrance to Respiration.

In Distensions of the Stomach likewise, by Meat, Drink, or Wind, the Liver is thrust upon the Diaphragm, and so checks its Motion. Distension of the Colon, the small Intestines, and in short of any part that lies upon the Liver, will crowd up the Diaphragm  
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into the Thorax, and so rob it of that room it wants, to perform the Act of Respiration in, as it ought to do.

The Liver, as to its Bulk, is very different in different Bodies; in Fætus's it is much larger, than in adult Persons, in proportion to the rest of the Body. But as the learned *Glisson* observes, it is less in Eunuchs, than in Men not castrated; in Capons, than in Cocks; in Water Animals than in those that live upon the Land. But not being sufficiently convinc'd of these Matters of Fact, and that this great Author might be mistaken in his Observations; I shall respite the Consideration of them, and only in general take Notice, that a more sluggish than ordinary Circulation, even where there is no Indisposition of the circulating Fluids, will increase the



the Bulk of the part where it happens ; that is, if the circulating Humours are not carried away with that Velocity they are brought thither ; for then the Vessels will be distended ; and consequently this Bowel where the Vessels make up so great a part of its Substance, will be so too, and it may be without much Injury to it ; as we see our Hands will swell with Cold : Which Instance so far agrees with us here, that the Circulation is retarded, and which occasions the Swelling without any great Inconvenience.

We are farther to consider, that this Bowel abounds very much with Blood ; for all the Blood that is sent to the Stomach, Intestines, Spleen, Pancreas and Mesentery by the great Artery ; namely, the cœliack, superior and inferior Mesenterick, in order to  
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its return to the Heart, is taken up by the Roots of the *Porta*, to be transmitted thither; and which therefore, upon the least Stop, will be apt to distend the Liver, as it passes thro' it, and be apt, as it were, to over-nourish it.

And under this Consideration, Tumors of all kinds will come, such as any way indispose, and make the Liver incapable of performing the Office appointed it by Nature.

Thus the Liver is liable to Inflammations, which here are of the same Nature, and proceed from the same Causes, that Inflammations in all other parts of the Body do; and may be defin'd an Effusion, or Extravasation of the Blood thro' the Substance of the Liver, which is caused either from the Thickness or Viscidity of the Blood, which makes it unca-

uncapable of circulating through the Capillaries of this Bowel; or else from the Turgescence of the Blood in the Vessels, where by reason of its great Motion and Expansion, and Rarefaction it breaks thro' the Capillaries; or else from Contusions by outward Violences. In all which Cases the Course of the Blood is check'd; and the Blood not being able to be carried forwards, Distensions in the Parts that hold it must arise, and the Consequences may easily be apprehended, *viz.* by a weight and heaviness in the right Hypochondrium, and troublesome Pain, a Fever, with a difficulty of Breathing, which are the Symptoms of the Inflammation of the Liver.

This Pain is in a particular manner to be distinguish'd by the sick Person's turning himself from  
one



one side to the other ; which, as it is more in the Substance, or in the Membranes, is more or less acute. The Substance of the Liver, being much less sensible than the Membranes of it, suffers not so much under these Distensions.

In these Inflammations of its Membranes, the Pain will run all along the *Pleura*, which makes it somewhat difficult to distinguish it from the Pleurisy

Our Hints, in these Cases, we take either from the Pain, which is not altogether so violent here, *Cæteris Paribus*, as it is in the Pleurisy ; neither is the Pleurisy attended with that weight or swelling in the right Hypochondrium, which is the Seat of the Liver. Besides, the particular Complexion, or Colour of the Face, which for the most part in all Diseases of the Liver, is Icteric,

rical, shews the Disease, and from whence these Symptoms take their rise. It is a Disease of a very bad prognostick always, as may easily be imagin'd. But more so when it happens in the gibbous or convex part of the Liver, than in the concave, as is observ'd by Practitioners: And the Reason is plain, that it is so from the close Connection it has with the Diaphragm in its convex Superficies, whereby it readily communicates its inflammatory Disposition to each part; the Danger of which is plain from the use the Diaphragm has in Respiration.

Whenever these inflammatory Tumors happen, the safest way is to discuss them, if it be possible; but if that is not to be brought about, we are to pro-

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mote Suppuration by all the means we can. The Disease then takes another Denomination, and is call'd an Abscess; which is made by the Conversion of these extravasated circulating Humours into *Pus*.

As when this purulent Matter has by its Acrimony corroded, and made its way thro' the parts that contain'd it, it takes the Name of an Ulcer.

The Colour and Consistence of Matter discharg'd from it, gives us this Prognostick, that if it be white and well digested, there is Hopes of a Cure; but if it be red, fœculent, and fœtid, there is but little Expectation to be had from such a Case.

Having given an Account of the hot and inflammatory Tumors of the Liver, and the Consequences



sequences of them ; the cold ones will come next to our Consideration ; and they have their Seat either in the very Substance of the Liver, or in its Vessels or Membranes, or in two, or all these together.

Under the first Case falls the schirrhous Tumors of the Liver ; where its whole Parenchyma is turgid, with a serous watry Humour, which like a Sponge it seems to have suck'd up. The Vessels and Coats are relax'd in their Tone, and being fill'd and nourish'd with this depauperated Blood, want that Vigour they should have ; which when it so happens, they will in time be the Cause of a Dropsy : And this Distemper will have its first Seat here ; as oftentimes it is produc'd elsewhere, but afterwards

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by the Blood it communicates its Impressions to this Viscus.

The Ancients assigning to the Liver the Office of Sanguification, look'd upon it to be the chief Cause and Seat of the Dropsy. They were farther confirm'd in this Notion of theirs from the Observations they made, that all Diseases of the Liver, if let run to any height, terminated in the Dropsy; and which indeed shews that the Liver has oftentimes a great deal to do in this Distemper; yet not as a Bowel of Sanguification, but as a part through which a great Number of Blood-Vessels take their Course; and where the circulating Humours contained in them, may meet with Obstructions; which Humours being still more plentifully sent by the Heart, and the Liver not being able to carry them forwards,

wards, or at least with the same dispatch they are brought; either from its own Indisposition, or that of the Blood, the watry parts of the Blood in these Distensions and Weaknesses of the solid parts, transude thro' their Pores, which being just by them alter'd into a Body, constitute this Disease.

To make this the more intelligible, this following Experiment may serve, viz. by making a Ligature in the *Vena Cava*, between the Diaphragm and the Heart; for then the Blood which is sent from the Heart by the great Artery, not having a Passage to return to the Heart, the Veins will be distended, and the watry ferous part of the Blood will make its way thro' the Vessels; and in an Hour or two's time, we shall see a great Plenty of extra-



vacated Serum in the Cavity of the Abdomen.

That Obstructions in the Liver, or any other part, may in process of Time, bring about what by a Ligature is effected in an Instant, is, I think, intelligible enough.

The Liver has likewise, as was before observ'd, its particular Tumors; that is, where their Causes do not equally diffuse themselves thro' the whole Substance of it. And they have likewise their Original from some Obstructions either in the Blood-Vessels, or the bilious Ducts, or from both.

We do not mean by Obstructions here, a total Stop of the Circulation of the Humours thro' the Liver; for so it would not be consistent with Life; but such a Disposition of these Humours, as to render them unfit, and indisposed

disposed for a free progressive and circular Motion; whereby they move so slowly, that their Motion resembles a Stagnation. And here I take it to be in some Vessels especially, the rest being free enough to perform tolerably the Business of Circulation.

Stones, Ulcers, and schirrhous Tumours, as they proceed from these Indispositions of the Fluids, so they will aggravate the Cause of these Obstructions. But the most frequent Cause is the thick and viscid Constitution of the Blood, which being loaden with a too viscid Lymph, or saline coagulating Particles, loses that Acidity that it is necessary for it to have, to be able to run thro' the slender capillary Vessels of the Liver; and so is the Author of Obstructions in the part where it stays.

The Bile likewise being after this manner thicker than ordinary in its Consistence, frequently produces Obstructions. For by this means it being incapable of being taken into the slender Capillaries of the biliary Ducts, it there stagnates; and being again received into the Blood either by the Roots of the *Vena Cava*, or the lymphatick Vessels, there follows the Distemper call'd the *Jaundies*.

Which, according to the Colour it tinges the Habit of the Body with, has the Denomination of the yellow and black *Jaundies*.

That the *porus biliaris*, or *Meatus Choledochus* may be obstructed by a glutinous and too viscid Bile, is not so conceivable; as by Tumors, Stones, &c. which do it by pressing upon them,



them, which has been discover'd by *Autopsy* to be a Truth.

But that the slender Capillaries of these bilious Vessels may be unable to transmit that Bile that is brought to them, gives no Difficulty to our Apprehensions. The Method we take to cure these Disorders, proves as much, which is effected by attenuating Medicines ; which as they open Obstructions, so they render the Fluid more liquid by their deobstruent Quality ; according to the Observation in Practice that those Medicines which facilitate the Secretions or Separations to be made in the Blood, do likewise dispose the Colatures to the better Performance of their Duty.

But many are of Opinion, that Obstructions alone are not sufficient to cause this Disease ; and also that it may happen without Ob-

Obstructions. To prove this first Assertion, they give us Instances of Persons labouring under Obstructions; as Chloretic and Hypochondriac Persons who have no Jaundies, and therefore that Obstructions alone are not sufficient. But here they should likewise have prov'd that the Liver was not obstructed in these their fancied Obstructions.

To prove the latter, *Sylvius* from *Autopsy*, brings Instances of Icteric Bodies that he had dissected, where there were no Obstructions to be met with: And to strengthen this Notion, the biting of Vipers, which are own'd by all Authors to give rise sometimes to the *Jaundies*, and which in so short a time can hardly be supposed to make such Obstructions, is a farther Argument.

This Effect may be imputed to  
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a fermentative dissolving Humour, which by the Biting, the Viper has communicated to the whole Mass of Blood; and which by its great Activity and Power it has of dissolving the Blood, renders it more bilious: The Bile and the red part of the Blood possibly differing in nothing else but in its greater or less Attenuation.

Passions will produce the same Effect. I have seen a Child's Skin, upon eating of Garden Nightshade-Berries, ting'd all over with yellow; which from the Cure it so readily received, cannot be thought to have proceeded from Obstructions.

These Instances given, encourage us to divide the *Jaundies* into a Disease that owes its Original to a hot as well as a cold Cause; to the great Attenuation  
and



and Fluidity of the Bile, as well as Viscidity, the Author of Obstructions.

This Distinction may be of Service to us in the Method of Cure of the *Jaundies*; which, as it proceeds from different Causes, the Method of Cure must likewise be diversified; for otherwise the Physicians treating all Ictèrical Persons alike, must oftentimes be disappointed of their Aim.

The Liver, as it is a glandulous Body, is a proper Seat for schirrhous Tumors; which here, as in other parts of the Body, are hard Tumors, resisting any Impression made upon them; and when exquisite, are without Pain, tho' at their beginning, before they are confirm'd, they will have Pain. These Tumors frequently arise from the Matter of them, being

being insensibly, and in process of Time, accumulated in the Liver ; tho' they are likewise the Consequences of Inflammations, where the thinner parts of the circulating Humours being evaporated, the remaining thicker Matter became the original Cause of a schirrhous Tumor ; and this, it may be, in the very Glands of the Liver ; a pretty plain Instance of which, I think, we have in *Glisson*, which he had from *Regemorter*, who, upon dissecting of the Body of one, who, in his Life-time, was for several Years troubled with strumous Swellings in his Neck, he found his Liver to be all over stuff'd with Glands of the bigness, some of a Pea, others of Beans, which being cut, contained nothing liquid in them : But, as in Figure, so in Substance, they exactly resembled

sembled Glands, compounded, as he describes them, of a Clay-coloured pituitous Substance.

These Glands had so encreased the Bulk and Weight of the Liver, that it was twice or thrice as big as naturally it should have been.

The Lymph being sometimes extravasated, will make a peculiar Coat of its own, and be contain'd as it were in a *Cystis*; and which, according to the Consistence of the Matter of the Tumors, bears several Denominations.

Thus, if the Matter be pretty much of the Consistence of Honey, they are called *Melicerides*: If it be still coagulated into a harder Substance, they are called *Atheromata*: And if it be yet harder, and have a Consistence



sistence as firm as that of Suet, they are called *Steatomata*.

Instances of these kinds of Tumors are to be met, tho' rare : And one I shall relate to you from the abovenam'd Author, Dr. *Glisson*, in his elaborate Treatise of the Liver, which is remarkable enough ; and that is of the *Atheromatous* kind, which was found in the convex and gibbous part of the Liver backwards, near to the Diaphragm, in the place where it is perforated by the *Vena Cava*. The Figure of it was round, and near as big as one's Fist ; and being freed from the Liver, it weigh'd five Ounces, six Drachms, and thirteen Grains. Its Coat or *Cystis* was almost as thick as the *Cutis*, and contain'd in it Matter or Substances of two sorts ; both of which were very thick in Consistence, and not at all

all Fluid : One was transparent like to Jelly, the other look'd like a thick Cream. In this Body the Liver was larger than usual ; as also were the Veins of the Mesentery, Intestines, Stomach, and particularly the Spleen, Which could only happen from the pressure of this Tumor upon the capillary Blood-Vessels in the Liver ; whereby they became so streightened, as not to be in a Condition to give that free Conveyance of the Blood they do in its Circulation ; and which therefore not only influenced all the Vessels of the *Porta* within the Liver, but also all those that fed the *Porta*, which by this Stop given to the Circulation, distended them by this over-load of Blood ; and which, as was before observ'd, will be the Consequence in any part, where the

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Blood

Blood is brought with too great Impetuosity, or in such Quantities as it cannot be carry'd as readily away.

The Liver is likewise incident to watry Tumors, call'd *Hydatides*; which are pellucid Bladders distended with *Serum*: And they appear to be the very Membrane of the Liver, raised from its Substance by this serous Humour. These, according to the Liquor they contain, are sometimes as large as one's Fist, and oftentimes less; sometimes fewer, and sometimes more in Number, and that both in Men as well as other Animals. If these by any Accident are at any time broken, the Water contained in them falls into the Abdomen; from which a Dropsy must certainly ensue.

In Sheep that die of the Rot, as it is generally phras'd, we oftentimes meet with Tumors al-



most peculiar to them in the Body of the Liver ; in the middle of which there is a Cavity full of Water, and which likewise contains Worms in it.

The Liver is single, and but one ; and in Men but one continuous Body ; tho' in Quadrupeds and several Birds, it is divided into Lobes. The convex Superficies of it is very smooth, but its concave is more uneven ; and besides that great Fissure where the *Vena Umbilicalis* enters it : And which has created, in my Opinion, that needless Dispute about the Division of an human Liver into Lobes.\*

It has three *Simus's*, as they are call'd by some, or Impressions made, as I conceive, by the parts it lies upon ; the largest of which is in the left Side, where the Liver lies upon the right Side of

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\* Vid. Dr. Drake's Anatomy, p. 100, &c. Edit. ult.

the Stomach, the *Pylorus*, and a part of the *Intestinum Duodenum*. The second is in the right Side near the lower part, and contains almost wholly the Gall-bladder. The third is in its upper part, where the *Vena Cava* goes out of the Liver. These are the most remarkable Cavities; and though there are several other Impressions made upon it by the adjacent parts, yet they are of that small Consideration, as not to deserve our farther Notice.

I think it may with Safety be affirm'd, that all Animals have always a Liver; and but one, notwithstanding these following strange Histories, which I am going to relate to you, whose Veracities are not much to be rely'd on.

The first is from *Zacutus Lustranus*, in his Book *de Prax. Medica Admiranda*, in the 38<sup>th</sup> Secti-

on, which communicates the Observation of a Woman, who, upon Obstruction of her *Menses*, had fallen into a Tympany, of which she dy'd ; in whose Body, upon Examination, there was no Liver to be met with, he says, but in its stead a great Mass of Flesh, or a filthy Substance of great Bulk, extended from the Region of the Liver, down to the Navel, which being taken out and weigh'd, the Weight of it amounted to six and thirty Pounds.

The second is from *Skeuckius*, in his third Book of Observations, and the second Section ; and that is of an *Antwerp* Merchant, in whose Body, upon Dissection, there were neither Liver nor Spleen to be seen. But the Intestines were in Substance altogether carnous, and much more solid than the muscular Flesh generally



nerally is. It was almost as firm, he informs us, as that of the Heart. The *Vena Cava* had its rise from the Intestines, after the same manner the *Vena Porta* uses to have in other Bodies. This Man, in his Life-time, was very liable to Inflammations, and Abscesses in his Intestines, and for some time before he dy'd, had labour'd under a Dropsy.

The third, *Skeuckius* barely relates from *Gemma* : And that is of one who had two Livers. But there being no mention made of this Subject's having two Gall-bladders, two excretory Ducts, two *Vena Cava*'s, and two *Vena Porta*'s, we may favourably conclude, this Author might, without any Pleasure he had of telling a strange Story, mistake a Liver unusually divided, and as there are Accidents and Lusus's in Nature,

for two Livers. Nor might the Mistake of the former Anatomists be less, who from the odd and unusual Situation and Configuration of the Liver, fancy'd it not to be at all.

However, it must be confess'd, that these are very extraordinary Instances ; tho' not concluding that any Persons can live without a Liver, or some such Organ for the Separation of Bile.

This red Colour that it shews it self here to us with, is not its proper Colour, but is wholly owing to the Blood it has within it, which we may, by Injections of Water, so clear it from, that it will become white.

It is cloathed with a thin Membrane, whose Origin some will have to be from the *Peritonæum*. But, in my Opinion, the *Peritonæum* may be said as well to be  
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from this Membrane ; they being form'd in the Fœtus at the same time. And farther, when Chops or Fissures happen at any time to the Liver, and that this Membrane is broken, Nature effects the Cure by bringing a new Skin on the Lips of the Wounds on both Sides ; the Matter of which is brought by Vessels of its own, and none belonging to the *Peritonæum*.

It may be separated from the Substance of the Liver, but hardly without taking some of its Substance along with it.

The Use of this Coat is to protect the Liver against any Injuries that might be offer'd to it by the neighbouring Parts ; and to keep it whole, and together ; which is of it self a Substance very friable and brittle. And that such a Cure was necessary, must



be concluded, as well from the safe Passage its Substance is to give to all the Blood, which is brought to it by the *Vena Porta*, from the Spleen, Pancreas, Omentum, Mesentery, Intestines, and Stomach, as also because by it are to be made the Separations of the Bile. So that, whenever there is a Solution of this Continuity, viz. a Breach made by any Accident; in this part the Bile can be no longer separated from the Blood, but mix'd together, must stagnate.

The Causes of these Solutions are either Wounds, Contusions, or Corrosions by sharp Humours; Obstructions, of which before, and Inflammations, are taken Notice of by some Practitioners. And sometimes in Wounds and Concussions of the Brain, there has been found an Imposthume of the  
Liver;

Liver ; which is mention'd by *Job à Mekreen*, in his *Observat. Medic. Chirurgic. Observat. 1.*

They proceed (according to them) from thick Flatus's, which are kept in by this outward Coat, and swell and inflate the Liver ; and by distending the Membrane, create that Pain complained of in this Case.

The *Dignosticks*, to know this Disease by, they tell us, are from a Swelling in the right Hypochondrium, accompany'd with very great Pain, which yet is not continual, but is sometimes greater, as at other times less ; and carries not that Heaviness or Weight along with it, that other Tumors of the Liver do, and which, if press'd upon with one's Hand, do readily give way without any Noise or Appearance of Fluctuation, to give any Umbrage for suspecting an Abscess there.

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I confess, it is not impossible, but Wind may be gather'd here, so as to divide and separate this Membrane from the Substance of the Liver, as well as serous Humours, which is oftentimes known; yet probably, they are oftner Distensions of the neighbouring membranous Parts, which might, from their nearness of Situation, be mistaken for those of the Liver. For I don't recollect any one Instance, where, upon Dissection, the Liver was ever found so inflated. And it is farther own'd, that in these Cases, the Colour and Complexion of the Face and Skin is not so alter'd, as it usually is in other Disorders of this Bowel.

The Danger that must ensue from the Wounds of the Liver, its Contusions and Corrosions, may easily be apprehended; as that



that when they happen in the Vessels, they are still worse than when in the Substance ; tho' for the most part they are both together affected. Yet there are Instances to be met with, even where Wounds have been cur'd ; though possibly, not one in a thousand can escape. And to this Purpose *Hildanus* mentions one who recover'd, after a part of his Liver had been cut out from the Wound he had receiv'd, and where the Patient suffer'd very severe Symptoms. I could furnish you with more Instances, but this may be sufficient to shew, that the Wounds of the Liver are not always Mortal, as have been pronounc'd.

The Figure of the Liver is contriv'd the most agreeably that can be, for the Performance of the Actions, and the Uses design'd it by Nature ; as also the most accom-

accommodated to the neighbouring circumambient Parts; otherwise, where the Parts contained are not fitted to the Parts containing, they must of necessity incommode one another in their Actions; and that this is the Contrivance of Nature, to avoid this Inconvenience, may be argu'd from the Diversification of the Liver in several Animals, which it suits to the Cavity that contains it, and best disposes it to receive the change it is to make, upon the change of Posture in the Animals, in their several Actions and Motions.

The Substance of the Liver is soft and brittle, excepting the Vessels and Membranes, and may be pretty easily wash'd away, scrap'd or brush'd from the Vessels that are interwoven with it. \*

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\* The manner of doing of which, may be seen in *Comper's Anatomy of Human Bodies.*

The Ancients judg'd it to be nothing else but concreted Blood ; but Time and Industry have taught us better, and plainly discover'd to us, that its Parenchyma are Glands fix'd to the capillary Extremities of the Vessels, or into which the importing Vessels empty themselves, and the Exporters have their Origination there, to receive the several Pieces, which by the Similitude of their Pores they are best able to do. It has Vessels of all Sorts, and in great Plenty ; as Veins, Arteries, Nerves, lymphatick Vessels\*, and proper excretory Ducts ; to which some add the Gall-bladder, and consider it only as an Expansion of the *Meatus Cysticus*.

It has Veins of two Sorts, and which bear two different Offices ;

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\* Vid. Nuch's Adenographica Curiosa, and Dr. Drake's Anatomy of the Liver.



for the *Vena Porta* is an importing Vessel, and what is peculiar to this Bowel, brings Blood to it: And in this Particular, answers the End and Use of an Artery. As it enters into the Liver, it is strengthened with another Coat, which by some is call'd *Vagina Porta*, others, *Capsula Communis*; and because the *Porus Biliaris* is involv'd in it as well as the *Porta*, it is dense and car-nous, and goes along with it in all its Ramifications; and in this respect likewise it makes the Figure of an Artery. About half an Inch after its Entrance into the Liver, it forms, as it were, a *Sinus*, and there it divides it self into five large Branches, which disperse themselves over the whole Liver.

Thus this Vessel, in both its Extremities, spreads it self into  
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an infinite Number of Branches. The Superior, as is here describ'd, run thro' the Liver; the Inferior are like Roots distributed thro' almost all the Parts contain'd in the Abdomen, viz. Spleen, Stomach, Guts and Mesentery, where they take up the Blood, and convey it to this Trunk; where it is farther to be transmitted by these superior Ramifications to the *Vena Cava*, which likewise has its capillary Roots dispers'd all over the Liver, and are corresponding here to the Capillaries of the *Porta*, as Veins are to Arteries other parts of the Body.

These several Ramifications make three, or sometimes more remarkable Trunks, which likewise before they leave the Liver, run into one common Trunk, which presently after its Exit, takes its Course through the Diaphragm,

phragm, and has the Name of the ascending Trunk of the *Vena Cava*.

The Ramifications of the *Vena Porta* running from the concave Side of the Liver upwards, and towards the Sides, as those of the *Cava* taking their Course obliquely downwards, do frequently cross each other: But intermix'd as they are, if you separate the Membrane that invests the Liver from it, and scrape away the Substance or Parenchyma of it, so as to come to the Sight of their larger Branches, you may easily distinguish them from one another, by blowing into the great Trunk of either of them; for then you shall perceive the Wind to distend the Branches belonging to that Trunk you have blown into, without touching the other. But their several Branch-

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ings may be yet plainer shewn, by injecting Wax into their great Trunks, and which ting'd with different Colours, gives you a plain View of them. A Figure of which may be seen in Mr. *Cowper's* Anatomy of Human Bodies.

And here we are to take Notice of a Passage, which the Liver in Foetus's has, more than in the adult, and it is call'd *Canalis Venusus*, which arising from the *Sinus* of the *Porta*, carries a great part of the Blood brought by the umbilical Vein, directly in full Stream into the *Vena Cava* above the Liver, and which after the Birth for the most part is clos'd.

These Ramifications shoot themselves into Capillaries so extremely slender, that they are by no means to be discover'd by the Eye, or by any other help, that has been yet thought of,

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which has occasion'd great Difficulties about the manner of the Blood's circulating through this Bowel.

Some maintain these Vessels to be united by an *Anastomosis*, and that the *Vena Cava*, viz. the Branches of this Vein are continuous to those of the *Porta*; this Structure, they think, is as reasonably to be suppos'd here, as it is to be demonstrated by *Autopsy*, by the help of Microscopes in several parts of Animals; and that Objection, that if these Blood-Vessels are thus united, there can be no Separation made of the Bile, I think, may be easily satisfy'd, by conceiving that the Roots of the biliary Ducts have their Origination all along the Sides of the capillary Vessels of those Veins.

Thus

Thus the Liver then being suppos'd to be wholly vascular, its Glands are to be consider'd as so many innumerable little Grape-like Circumvolutions of Vessels, which like so many small ty'd Bottoms of Thread wound up carefully and conveniently together, have all along in their Passages and Channels, an infinite Number of biliary Vessels opening with their little Mouths into them, there to imbibe the Bile in the Circulation of the Blood, which by a Similitude of Parts, and Configuration of Pores, they are enabled by Nature to do ; after the same manner as the *Chyle* is taken into the Lacteals from the Intestines.

But supposing these Convolution of Vessels to be the only Glands, and the very Texture of the Liver: And that in this long



Tract of Vessels, there is sufficient Opportunity given for the biliary Vessels, which are all along affix'd to their Sides, to take in the Bile from the Blood; there will still remain this Difficulty to account for, *viz.* the Taste the Liver has. For cleanse it as free as you can from all the circulating Humours it contains, it will still be of a different Taste from that of any other Gland, or glandulous part of the Body; which seems to argue it to me, to be of a different Substance; and so, that different Glands have different Substances: For if Glands consisted of Vessels only, *viz.* Veins, Arteries, and Nerves, with their excretory Ducts; these Vessels being all alike of the same Taste, in all Parts of the Body; the Glands being freed from their Juices, must needs be so too, the  
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contrary whereof is manifest; and so we must conclude them to be constituted of peculiar Substances different from the Vessels, which offer themselves with their particular Tastes.

Therefore, I am prevail'd upon to think, that these Glands that make up this peculiar Substance of the Liver, are affix'd to the Extremities of the Ramification of the *Vena Porta*, as was before allowed, &c. These Glands (according to the elaborate *Malpighius*) have six Superficies like a Die; and which he says are much more conspicuous in Fish, and the more imperfect Animals, than in Men.

These Glands hanging like Grapes upon a Bunch to the Vessels, make as it were so many little Lobes, which are all cloath'd with their proper Membranes.

These I take to be the Medium between the importing and exporting Vessels; and that by the Interposition of these, the Importers transfuse their Liquor into the Exporters. How this Separation is made, shall be the Consideration of another Place.

Notwithstanding the *Vena Porta* does the Office of an Artery, in bringing Blood to the Liver, it has an Artery of its own, which arises from the *Cœliack*, and is call'd the hepatick Artery.

In Men it is very considerable, and bears Proportion to the Diameter of the *Porus biliaris*; but in Quadrupeds it is not so large: And the reason of it may be, that the *Vena Cava* being plac'd more horizontally in their Liver, it does not so much require the Assistance of the arterial Impulse, directly to carry the Blood for-



forward in its Circulation ; whereas in Man, the ascending Trunk of the *Vena Cava*, in his upright Posture, being perpendicular, must of Consequence stand in need of a greater Impetus to do it.\*

It has Nerves from that superior Plexus of the Abdomen, which *Willis* calls the Hepatick, and arises from small Twigs of the intercostal Trunk of the right Side. From this Plexus a great Bundle of Fibres which take their Course towards the Liver, and enfolds the Artery like a Net, on purpose, as is thought by some, to give a check to the Motion of the Blood, if it should chance at any time to be too impetuous.

These Nerves supply the Liver with animal Spirits, which if they do not promote by their Mixture, the Separation that is to be made

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\* Vid. Dr. *Drake's Anatomy*.

there, they at least give the necessary Life and Vigour to the Membranes and Vessels of it, which being thus preserv'd in their Tone, are capable of performing their Parts, without which they could not do it; no, nor so much as receive any Nourishment.

The Liver abounds with a great Plenty of Lymphæ-Ducts, which are discernible enough in most Bodies that come under our Inspection: But in some they are much more so, than in others.

*Malpighius*, desirous to make the Liver a conglomerate Gland, and which then he thought should have but one excretory Duct, could not think them to take their Original from the Substance of the Liver it self, but from those conspicuous conglobate Glands only, which discover them-

themselves in the hollow of the Liver, under the *Capsula*, in the place where the *Porta* and *Porus biliaris* enter it; from whence taking their Course directly along the Mesentery, they open themselves into the *Receptaculum Chyli*.

But the contrary, I think, may be readily made appear; and that these Lymphæ-Ducts have their Original from the Substance of the Liver all over it: No Part which receives Nourishment, can be without them; which, I presume, will not be deny'd of the Liver.

To make this more plain, let us consider the Method Nature follows in the Distribution of the Nourishment of our Bodies; for which great End the Circulation of the Blood seems principally to have been instituted; for by this Means the nutritious Parts,  
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together with the rest of the circulating Mass, are carry'd to all the parts of our Body.

The serous Part of these circulating Humours, is the greatest part of them ; and in respect to the nutritious Parts of the Blood is their Vehicle, and keeps them sufficiently diluted for their Conveyance to the respective Parts ; which when it has there first for their Nourishment, it returns again to the Blood by the Lymphaticks.

Thus the lymph or serous Part of the Blood, to digress a little, is of great Consideration ; and obtains various Uses, according to the variety of the Glands in the Body, where it is separated.

That Separation made of it by the Glands of the Mouth, Stomach, Intestines, and Pancreas, serve to macerate, digest, and dissolve

dissolve our Food, and to extract as it were the nutritious, gelatinous parts of the Aliments, with which by their Vehicle, they are taken into the Lacteals by that way to be convey'd to the Blood, and so to all parts of the Body, and consequently to the Liver ; which when they are dispos'd by the Lymph for its Nourishment, being thus depauperated, return again to the Blood, and is received in all parts of the Body by proper Vessels, call'd *Lymphatick*, there to receive new Impressions.

This being granted, we may safely conclude, that no parts of the Body that receive Nourishment, can be without them ; and consequently the Liver throughout its Substance must have them. But to suppose this Separation is to be made by conglobate Glands alone, is not so necessary, as the late

late worthy Author seems to hint. For these Lymphaticks that return their Lymph to the Blood from the Limbs, do not discover to have their Origin from any near the Glands; and I think it not difficult to conceive, how the thinner Parts of this Fluid may drain away from those thicker nutritious Parts, which it has left fix'd in the Pores of the Parts for their Nourishment, and be taken in at the Roots of these Lymphæ-Ducts, which afterwards running into larger Branches, and make those Trunks which are conspicuous on the Surface of the Liver.

I must confess, the extreme Capillaries of these Vessels, are not to be prov'd by *Autopsy*, no more than those of the Veins and Arteries are: But if we compare these conspicuous lymphatic Vessels, with Blood-Vessels of the same



same size, and consider the Number of Capillaries that must meet together, before they constitute Trunks of that bigness; we may be easily led into a Notion, that the Capillaries of these Lymphatics likewise are sufficient in Number to have overspread the whole Substance of the Liver, or rather from their Number that they must have done so, to be able to have constituted Vessels of that size.

The Gall-bladder is a membranous Vessel or a Cavity of the shape of a Pear, and is situated in the hollow Side of the Liver, on the right Side, and under the thickest part of it; where it forms it self a Cavity to lodge in. That Part which hangs without the Liver, rests upon the right Side of the Stomach, and Colon, which it often dyes of a yellow Colour.

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It is divided into its Fundus or Bottom, and Cervix or Neck. The Neck is much the narrower part, and is wrinkled in its inside to hinder the too hasty descent of the Bile.

The Bottom is larger and wider, and is that part which contains the Bile, and which it generally tinctures with its Colour.

As to its Bulk, it is very seldom the same in different Subjects. Its Bottom, extended with Bile in Figure and Bulk, pretty much resembles a small Hen's Egg, which contracting it self into a narrow Neck, is continu'd to the *Meatus Cysticus*. But neither is the Figure the same in all Bodies; for in some it is longer and narrower, and in others shorter and broader.

It is fix'd to the Liver both by Vessels and Membranes, *viz.* by  
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the common Membrane, and by a Process of the *Capsula* that involves the *Porus biliaris*, and *Porta*.

Besides these Membranes, some Anatomists will have the Gall-bladder to consist of three proper Coats.

The first and outmost which they call the vascular one; the second is muscular, which they describe to consist of two Orders of Fibres: The third, which is the inmost, they look upon to be nervous, after the Texture of the Stomach. But whatever might lead these Inquirers into this Mistake, I presume it may be made appear, that its Texture is not according to their Description, by ocular Demonstration; for upon Examination of it by a Microscope, we find it to be compos'd of two Membranes only; with



with a spongy vesicular Substance between them. These Membranes, like two Walls, protect this middle Substance contain'd within them, and which consists of an infinite Number of Ramifications of Vessels, running along the length of the Gall-bladder, and as it were between Membranes lamellated, as I had an Opportunity of discovering with a Microscope, in a piece of the Gall-bladder dry'd, which before had been blown up with Wind.

These Vessels, without Dispute, terminate into those Glands that serve for the Separation of the mucous into that Viscus which is to defend the inward Membrane against the Acrimony of the Bile.

This then being the Structure of the Gall-bladder, it is plain, that it is passive in its Evacuati-  
ons, and that they principally de-  
pend

pend upon the Pressure of the neighbouring Parts.

The Gall-bladder has belonging to it, Veins, Arteries, Nerves, and Lymphæ-Ducts, and Gall-Ducts. The Veins empty themselves into the *Porta*. There are two of them, and are therefore call'd *Cysticæ Gemellæ*. The Arteries and Nerves it has from the hepatick Vessels.

As the Veins make their Exit, the Arteries and Nerves enter into the Bladder about its Neck, which from thence running along towards the bottom, become more and more divided, sending plentifully every where Branches all along the Circumference of the Bladder.

The Lymphæ-Ducts run along from the bottom of the Bladder to the Neck, where they join into one Trunk.

The Gall-Vessels belonging to it, are of two Sorts, *viz.* such as bring the Bile to it, and such as carry it away.

The Vessels of the first kind have their Original from the Liver ; some of which probably come directly to the Bladder from the respective Glands, whilst others, as may be prov'd, open into the Hepatick-Duct.

*Glisson* has long ago taken Notice of a very remarkable Gall-Duct, which enters into the *Vesicula Fellea* at its Neck, by that part where it abounds with Wrinkles. This Trunk, says he, tho' it be small, and scarce by a hundredth part so big as the *Porus biliaris* ; yet it distributes its Branches and capillary Roots, thro' the Parenchyma of the Liver, and seems to have a Branch of the *Porta* accompanying it,



as well as the *Porus biliaris* has ; which it is hard to distinguish it from, any otherwise than that it takes its Course towards the Gall-bladder.

He farther adds, that it is difficult to find its Insertion here, as is that of the *Ureters* into the urinary Bladder ; but may be suppos'd to be of that spongy Protuberance, which is to be discover'd near the *Meatus Cysticus* ; and which he thinks does the Office of a Valve, and hinders the return of the Bile.

This worthy Author farther owns, that he has discover'd two of them sometimes ; but this he thinks to be only *Lusus Naturæ*.

In this *Viscus* are several Ducts that open themselves both into the *Vesicula Fellea* near its Neck, and also into the *Meatus Cysticus*.

This I have plainly seen in an Ox's Gall-bladder, by tying the *Meatus Cysticus* near to that part, where it unites it self to the *Porus biliaris*, so close, that no Wind can pass that way ; for then by blowing into the Hepatick-Duct, you shall presently see the Bladder inflated. And farther, if you lay open, with your Incision-Knife, the Bladder, together with the *Meatus Cysticus*, to the Ligature, you shall find upon blowing, the Wind to vent it self by several Mouths, both into the *Vesicula Fellis*, and the *Meatus Cysticus* ; and which plainly proves, as was before taken Notice of, a Communication between the *Ductus Hepaticus*, and those of the *Vesicula Fellis*.

These Ducts are so very slender, that I have not been able my self, or ever heard any that were

were to inject them with Wax, or any other thing that would more plainly discover them to us; but I think, from the foregoing Experiment, their Existence is clearly evinc'd; and which then may be suppos'd to receive Bile by their capillary Roots, as those of the *Porus biliaris* do, in order to convey them to the *Vesicula Fellis*, there to be repositied for the Purposes of the Animal Economy, according to the Institution of Nature.

From their Office, there has been the Denomination of Hepatick-cystick-Ducts given them. The Ducts that carry away the Bile both from the Gall-bladder and Liver, shall be given there, and are call'd the Hepatick-Duct, and the *Meatus Cysticus*, and the *Ductus Communis Choledochus*.



The Hepatick-Duct arises from the Liver in several Branches or Roots, where taking its Course without the Liver, it meets with another Duct, which is that now mention'd, and is call'd the *Meatus Cysticus*, which coming from the Gall-bladder, about two Inches (the same distance that the Hepatick-Duct is from the Liver) it is join'd to it ; where from the Office it bears, both in respect to the Liver and Gall-bladder, it takes another Name, and is call'd the *Ductus Communis Choledochus*, or common Duct ; which is the third Duct mention'd, and is farther carry'd to the *Duodenum*, or *Jejunum*, where it is inserted obliquely into one of these Intestines about four or five Fingers breadth from the *Pylorus* at the same place, where the Pancreatick-Duct opens it self into the Intestines oftentimes,

times. By this oblique Insertion, and by the spongy Protuberance of its Mouth, which seems to have the use of a Sphincter-Muscle, the Regurgitation of the Bile to the Liver is prevented.

The Hepatick-Duct, and the *Vena Porta* run along together thro' the whole Liver, and being invested with one common Coat, the larger Branches of it with the larger of the *Porta*, as the smaller with those of the smaller, they seem as if they were but one Vessel; yet upon Examination, they are easily distinguishable: For the biliary Ducts are, all along in their Ramifications, much less than those of the *Porta*, and are likewise ting'd with Yellow from the Bile which they carry; and are to be seen by blowing into the *Porus biliaris*, and still plainer, without

any Dispute, to be shewn, by injecting Wax into them, as is here to be seen.

We meet with Stones frequently in the Bladder, which are much lighter, and more spongy than those of the urinary Bladder, and will swim above Water; which sometimes lying in the Neck of the Gall-bladder, obstruct the Hepatick Ducts opening into it, and by that means prevent the import of Bile into it, and causes an incurable *Jaundice*. In which Cases it has been observ'd, that the Bladder has been full of a Liquor, that has not had the least Taste of Bile, and which we may reasonably think to have been the Matter separated by the Glands of the *Vesicula* before spoken of.

Having describ'd the Liver at large, with the Vessels belonging to it. The next thing that

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offers



offers it self to our Consideration, is its Office and Function, which is evidently the Separation of the Bile from the Blood. But how this Bile is separated, is a Difficulty worth our inquiring into. To solve this, some have imagin'd it to be done by the help of Fermentation; whilst others think it may be brought to pass Mechanically, without the Assistance of any Ferment, purely by the impelling, progressive, and intestine Motion of the Blood; where the Glands of the Liver, with their importing and exporting Vessels opening into them, like Sieves or Filters, give Passage only to its bilious Parts, according to the Configuration of their Pores, and the Conformity of the *Moleculas* of the Bile that is to pass thro' them.

They

They that cannot look upon these Glands to be merely Passive, but that they contain something of a fermentative Nature in them, by which the circulating Humours, as they run thro' them, are so alter'd, as to become better dispos'd for quitting its bilious Parts; are mov'd to it from a Consideration of the close Union by which those bilious Parts adhere to those of the Blood in the *Porta*; which is not by simple Contact only, and so easily separable, as Bodies slightly mix'd are.

This they think to be apparent from the Taste of the Blood in the *Porta*, which has not the least of that of Bile in it; and which after Separation, will, if remix'd to that or a greater Quantity, tho' but a few Drops, sensibly communicate its Taste to it. This, as it argues a superficial Mix-

Mixture only here, so it proves a close Union of it with the rest of the circulating Humours in the *Porta*, where by it is as it were lost.

This they enforce, by urging, that the Blood has longer time to make its Circulation in, thro' the Liver, than in other Parts; it being not so much accelerated by the direct rapid Motion of the arterial Blood in its full Force, as it is in the Kidneys, and other Organs of Separation, and consequently more subject to Obstructions, from whence proceeds most commonly a *Jauudice*; for the Arteries are few, in respect to the importing Veins. This Circulation they look upon to be a great Contrivance in Nature, to give sufficient Time and Opportunity for the Ferment to operate in, and destroy this close Connection.

But however plausible this Opinion may seem, and that Fermentations



mentations are able to bring these and greater Changes in the Blood; and that the slender Capillaries of the Vessels and Glands are suitable and proper Places for this Ferment to perform its Operation in, as the slower Progress of the Blood in them gives Time: Yet it will still remain as difficult to account for, how the Liver came by this Ferment. And either it must make it it self, or be serv'd with it elsewhere. This last, way I know not, that it is offer'd at by any, there being not the least Discovery made of any such importing Vessels as might convey it thither.

That the Liver serves it self with this Ferment, is not more probable. For besides, that the Difficulty would be no less to shew how even that was made here; it is plain, that there is no such peculiar

peculiar Juice to be met with ; no Organs for the Separation of any such Liquor (the Bile excepted, which is the Matter in Question how it is separated) are to be seen. And farther, the Taste of the glandulous Substance of the Liver, which is not at all disagreeable, if cleans'd from the Liquor in the excretory Ducts, viz. the Bile it self, shews there is nothing of that kind contain'd in them.

On the other side, they that endeavour to explain this Separation mechanically, and who suppose the Assistance of a Ferment not necessary, seem not to labour under such a Necessity of supposing Improbabilities. Nay, the Mechanism of this Bowel, seems extremely to encourage us to this Explication. Here is the *Vena Porta* branching it self into very slender Capillaries ; a pa-

renchymatous Substance, or Fibre-like Texture of the Liver. Here are Mouths of exporting Ducts opening into them, of different Pores, to receive their Liquors proportion'd to them. And here is the circular and intestine Motion of the Blood, with a farther *Vis Motiva* of that of the Compression of the Abdomen in Inspiration, before taken Notice of, to drive these different Juices into their proper Pores. And hence it is that Emeticks are so serviceable in a *Jaundice*.

To prepare you with our Notion of it, it may not be amiss to take here into our Consideration, the Fluidity of Liquors, which seem to consist in the actual Division of the Parts of the Fluid; which taken by themselves, are no more, than small, hard, and figur'd *Moleculas*; and which being join'd in a Body,  
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are only contiguous to one another ; but being of suitable Surfaces, are so free and fit for Motion, that they are perpetually changing Places, as we see from the ready Mixture of many Things put to them.

The different Consistence, Structure, Configuration, and Motion of these *Moleculas* that compound the particular Fluid, constitute their different Natures and Properties. Thus the *Moleculas* that make up the Body of Matter, are Homogeneous, and like to themselves, yet very different from those of Oil.

Now, if at any time two Fluids of a different Nature are mix'd together ; and their Parts are so accommodated, as but barely to touch one another, the Mixture which arises from them, may very well be compar'd to that of solid Bodies

dies being jumbled and mix'd together; and which because we see may be easily separated again by sifting, so may mix'd Liquors by Filtration; which may reasonably be thought to be brought to pass much after the same way, viz. by the Structure of the Fibres, as the Separation of the hard Bodies were by that of the Sieve; whereby the Figures of the *Moleculas* of the Fluid are so adapted to the Figure of the Pores, thro' which they are to pass, that they can receive such alone; and all others, as not able to enter, must be excluded.

This Mechanism may be easily conceiv'd to dispose of the Parts of Fluids, so loosely join'd, after that manner: But when the *Moleculas* constituting a Fluid are heterogeneous, yet consist of Parts so closely united, that, in respect

respect of their Superficies, they are homogeneous, there seems to be something forcible and violent; such as some Ferment or other to break this close Texture. This then lies upon us to shew, that the Liver, by its Structure, is able to effect this Change in the united heterogeneous Parts in the Blood, without any Fermentation.

To make this the more obvious, we are to consider the mechanical Progress that Ferments make in dissolving the Bodies they are mix'd with. And they are, I think, acknowledg'd on all Hands to effect it, by insinuating themselves into the Pores of the Parts of the mix'd Body; where they, like Wedges, being farther driven by some impelling Causes, do cleave and tear to pieces the Parts they have insinuated themselves



selves into ; and after that manner, intirely destroy their Union. But a larger Time and Space is always thought necessary for Ferments to act their Parts in ; than the Time of the Circulation of the Blood thro' the Liver, and the very slender Capillaries of the Blood-Vessels will allow of, as was before observ'd. On the other Side, if the Blood, with the Bile, tho' in strict Union, without any such additional Ferment, be driven with sufficient Force into the Substance of these Sieve-like Glands ; where the Mouths of the exporting Vessels likewise have their Originations ; and which, in a sound State, are easily suppos'd not to give way, or alter in the Configuration of their Pores, its Texture may be broken into, for the Mouths of the different Exporters

porters to receive the Parts suitable to them. Nay, farther, can it not be apprehended, that this impulsive Force, by which the Blood is driven thro' the Liver, is sufficient to force the proper Parts into the Mouths of the several Exporters, and where in a manner like melted Metals, they are oblig'd to take the Form of the Mould they are cast in; so that as Ferments, by their Wedge-like Action insinuating themselves into the Pores of the *Moleculas*, and heterogeneous Parts of a mix'd Body do destroy their Union; so here, these *Moleculas* being driven thro' the strait Pores of the Part, are broken to pieces, and forc'd into the Shape suitable to the Parts they are to pass thro'.

To encourage us in this Hypothesis, Nature seems very solicitous

licitous in proportioning the Motion of the Blood thro' the Liver, to the Task it is to perform there. And for this Purpose there seem to be in several Subjects several Contrivances. In Man, who walks upright, Nature has supply'd him with an Hepatick - Artery much larger than in Animals, whose Position is more horizontal; as in Horses, tho' their Liver be much larger; as if the exact proportioning of this Motion was a Matter of the greatest Consequence; for if it be carry'd too forcibly or rapidly thro' the Liver, there might not be allow'd sufficient Time for the Action, or it might offer Violence to the Parts thro' which it was to be driven.\*

If this Force should be weaker than ordinary, it may not be of

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\* Vid. Dr. Drake's Anatomy of the Liver.



sufficient Vigour to break the Connection of the Blood, by driving it into these narrow Pores of the Parts, where it is as it were to be modify'd anew, and to whom they owe their present Form, Configuration of Parts, and Structure.

For this Reason Man seems to be supply'd, as was said before, with an Artery larger than in other Animals, to quicken the Motion. As for the first Reason, the Blood, to break its Force, takes its Circuit thro' the Spleen; for whatever over Alterations have been imagin'd to have been made in the Blood by its passing thro' the Spleen, these only at present are prov'd, viz. that the Force of the Blood is broke, which by the *Porta* is to go from thence to the Liver. And secondly, that there is a Separation of Lymph made here, as appears by the

Lymphæ-Ducts, (with which this Bowel pretty much abounds\*) and which possibly, by taking somewhat from its Fluidity, may be a farther Bridle to its Motion.

That Anatomists should impute those Coagulations they have observ'd in the Bile of Bodies, that have not their Spleen taken out, to its Extirpation, I see no certain Reason; they may be Accidents and Effects owing to no such Causes. But if it must be so, it is as free for me to suppose, that it is for want of Lymph to keep the Bile diluted; for tho' the Blood loses some of its Lymph in the Spleen, yet it does not do it proportionably to what it does in the other Parts that feed the Liver with Blood by the *Porta*.

The Bile being thus separated in the Liver, and carry'd partly to the *Porus biliaris*, and partly

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\* Vid. Mr. *Cooper's* Anatomy, and *Nach's* Adenographica.

to the Gall-bladder by proper biliary Ducts dispers'd thro' its Substance, are by them to be convey'd to the Intestines ; where our next Inquiry will be about the Use it bears in the Animal Œconomy, which is, in my Opinion, for the Subtilisation and Attenuation of the *Chyle*, or dissolv'd Mass of Aliments sent down to the Intestines from the Stomach.

To this Purpose there seems to be one part of the Bile carry'd to the Gall-bladder, which is to be preserv'd against those occasional Times, and where by its stay it contracts likewise a greater Acrimony, and becomes a more powerful Dissolvent.

In these periodical Evacuations of the Bile, I cannot conceive the Gall-bladder to be any thing concern'd in sending it to



the Intestines ; there being no muscular Coat here to assist it, and promote its Contraction, as we have before observ'd.

The Bile then being thus press'd into the Intestines, it there mixes with the *Chyle*. I think it is wholly owing to the Pressure of the adjacent Parts, which is particularly promoted by Inspiration, and in the times the Stomach is distended with Aliments, and which in the Distribution of them to the Intestines, squeezes the Gall-Duct from this Bladder. From hence the use of Vomits in a *Jaundice* may be accounted for ; where by Virtue of its penetrating lixivial Salt, it farther dissolves the Aliments, which being still more subtiliz'd, and as it were, alcaliz'd, gives a greater Opportunity for the Lymph of the Stomach and Intestines to enrich themselves with their nutriti-

ous Parts; with which being impregnated, it may easily be conceiv'd to be taken in at the Mouths of the Lacteals without any suppos'd Fermentations or Precipitations. The thinner and more profitable Parts of the Aliments being thus taken by the Lacteals; the thicker, which were incapable of entering their Mouths, are dispatch'd away by the Intestines, and which by their peristaltick Motion are as serviceable in forcing the *Chyle* into the Lacteals, as the Fæces downwards.

In promoting this Motion of theirs, the Bile seems not so much concern'd, as has been imagin'd. For besides, that it is not probable, that thus diluted with the *Chyle*, it should be of that irritative Nature to provoke the Intestines, which when sincere and unmix'd in a sound State, gives no Disturbance at all to the Coats  
of

of its *Cystis*; which appears to be as sensible as those of the Intestines; and we see in coeliac Passions, where there are plenty of Stools, by the colour of the Fæces, that the Bile has little to do with them. But Dejections are chylous, and appear to proceed from a want of Bile to attenuate the *Chyle*, and make it fit to be receiv'd by the Lacteals; as may be conjectur'd from the Method of Cure where Practice directs us, as in Cases of Obstructions such Medicines as attenuate. *Borellus*, from a Consideration of what Blood pass'd thro' the Liver in every Circulation, which by the Proportion of the Diameter of the Blood-Vessels, he thinks to be about a twenty-fifth Part; as also from the Proportion that the Bile bears to the rest of the circulating Humours,



mours, which he judges to be about a tenth Part; and likewise contains the Quantity of Bile, which in every Circulation of the Blood thro' the Liver, must needs be separated there, in as much as these bilious Ducts are free and open, as those of the exporting Veins are; that therefore they will carry in them their full Quantity of Bile proportionably to their Diameter, which, in the compass of a Day, will be in Quantity sixteen times more than is contain'd in the whole Body, the Bile being made from *Chyle* only, according to him. He concludes, that there must be a Necessity of Circulation of it; and that the Bile is taken up from the Intestines by the Meseraick Veins, and there with the Blood remanded to the Liver.

But

But, with the Leave of this great Author, it must be said, that whatever Necessity there is for supposing a Circulation of the Bile, it cannot be return'd this way to the Blood; because it is evidenc'd by Anatomy, that nothing is convey'd to the Blood from the Intestines, but by the Lacteal-Vessels alone.

And secondly, that no Liquor does enter the Lacteals in a natural State in the form of Bile, as appears by the Taste of the *Chyle*. And thirdly, that no Lacteals leave any nearer Passage to the Liver, than by the Heart.

But farther, he uses no convincing Argument to persuade us that the Bile is not made from the Blood. The Instance, I am sure, he gives of Serpents, whose Gall-bladder, and *Porus biliaris* will be as turgid with Bile, after several

several Months fasting, as at any other time, argues to me, as if the Matter of Bile was in the red part of the Blood. And that it is not without Grounds, what has been asserted, that the Bile and red grumous part of the Blood do differ in nothing but a greater or less Attrition and Attenuation, which repeated Circulations will bring about.

Thus we see in hot Constitutions, where there are high Pulses, and brisker Circulations, the Constitutions are likewise more bilious, and the Persons that have them are more incident to Distempers of the Bile. But to pursue this Instance farther; if Bile can be allow'd to be made of *Chyle* only, or some Parts of the Aliments fresh taken, there certainly would have been, for want of Food after so many repeated Circula-



culations, a Scarcity of Bile; which was not the Case here, after so many Months fasting. For, according to this great Author, a small part of the Bile is carry'd down with the Fæces in every Circulation, which lessens its Store dy degrees; the contrary whereof is here experienc'd.

I might farther deny, (for he has not prov'd it) that the bilious Ducts are always employ'd in their full distended Capacities. They may indeed be so, when there is Bile enough to fill them. But this does not prove a Necessity of their always being so; but they are so contriv'd, that be the Quantity of the separated Liquors more or less, they are sufficient to convey away what is deliver'd to them by the Glands.

But still, in one Sense, it may with Safety be affirm'd, that a  
great

great part of the bilious Mass returns again to the Blood ; and that by the Lacteals too : For as by the Analysis of the Bile we are inform'd, that it consists of a great deal of Water, a little Oil, and a little Salt ; this Water, which is the lymph or serous part of the Blood, and which indeed is the greatest part of it, and of very great Importance, in consideration that it is a Vehicle for the Parts it dissolves, as was before observ'd speaking of *Chylification*.

This Lymph then, we may affirm, does the same kind Office to those parts of the Blood, with which being join'd, it has the Denomination of Bile ; which it keeps sufficiently diluted, becomes their Vehicle, and being well mix'd, gives them Conveyance to the Intestines ; where being  
mix'd

mix'd with the Contents there for the Purpose abovemention'd, such Parts of it as are fit to pass thro' the Colatures of the Lacteals are suck'd up, in order to be return'd to the Blood. But as was before observ'd, not one drop of it under the form of Bile, in a sound State at least.

The Bile, as it offends either in Quantity or Quality, oftentimes brings very great Disorders upon us.

For as in our natural State, when the Blood abounds with bilious Particles, yet not to that degree, so as to interrupt the Regularity of our Actions in the Animal OEconomy, which would be to make a Disease; but gives that sort of Constitution, that the Ancients call'd hot liver'd: We find by Observation, that our Bodies are always liable to hot Diseases;



Diseases ; such as Fevers, &c. and on the other side, where these active Parts are not so abounding, they are dispos'd to cold Diseases, such as Obstructions, Cachexies, &c. so in a preternatural State, how the Alterations are produc'd, may be easily accounted for ; the too great Quantity of it making the Blood more fluid and spirituous, as the want of it is more viscid in consistence, and less active.

That the Bile offends in Quality, may be granted, I presume, from the Alteration of the Colour, which is made in its preternatural State. Its natural Colour is Yellow ; but in a morbid State it will turn from that to a deeper Yellow, and so from a lighter to a deeper Green, so to a black Colour ; as may be seen by the Experiment of mix-

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ing

ing Acids with it; which they likewise coagulate (and as hath been seen) into a Substance not extremely unlike to Stones taken out of the Gall-bladder. The Affusion of Spirits of Hart's-horn, will redeem it from its Coagulations, when it is lightly so. But whether any Liquor in the Form and full Force of Acids can get to the Bile in the Liver, I think may be fairly question'd: But it is certain, it may meet them in the Intestines and Stomach, where (according to the degree of the Fermentation they make with it) they may produce either Flatulences, Vomiting, the Cholera Morbus, Diarrhæa and Dysenteries, according to the Parts affected, and where these heterogeneous Liquors meet.

From the Effervescence made by the Bile with the other vitiated

ted Humours, Flatulences frequently ensue, which will very well account for a great Number of the Symptoms of hysteric and hypochondriack Persons ; as we see hysteric Colicks oftentimes terminate in the *Jaundice*.

From this Fermentation of the Bile, with the vitiated Humours it meets with in the *Primæ Viæ*, the first Symptoms of Fevers may be very well explain'd, and also several of the consequent ones, as is own'd by Practitioners ; and it may be from the Speculation of the periodic Evacuations of the Bile in the Gall-bladder, the Doctrine of intermitting Fevers may be better establish'd, than it hitherto seems to have been. But to prosecute this as it should be, requires a longer time than is reasonable for me to take now ;



therefore, I shall conclude, and  
leave these Hints only to your  
farther Consideration.



*F I N I S*



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